

# Cancer Control Activities *of the* National Cancer Institute

By **RAYMOND F. KAISER, M.D.**

**C**ANCER CONTROL is concerned with the actual prevention of cancer whenever possible, with the discovery of the disease in its earliest stage, and with the provision of adequate services and facilities for diagnosis and treatment. Ideally, a cancer control program to be effective requires:

1. An alert and trained profession.
2. An informed public.
3. Suitable methods for prevention of the disease.
4. Case finding, screening, or diagnostic procedures which can be applied on a mass basis to sort out individuals with the disease from the remainder of the population.
5. Adequate services and facilities for diagnosis and treatment.

The cancer control program of the National Cancer Institute of the Public Health Service is designed to meet some of the needs which exist in these requirements and to demonstrate appropriate methods for fulfilling some of these conditions. This program, now in its eighth

year, has special implications for practicing physicians.

Cancer diagnosis and treatment frequently call for the services not of a single physician but of a qualified team. However, the cancer patient ordinarily is seen first by a general practitioner, whose diagnostic training and experience often determines the outcome. For this reason, the major emphasis in cancer control is placed on programs designed to aid the physician by improving professional undergraduate, graduate, and postgraduate education and by providing diagnostic and other special services to help the physician be effective.

If the physician is to manage successfully an optimal number of cancer cases, he must bring to his practice an awareness of cancer in all of its diverse manifestations. Obviously, the place to inculcate such an awareness is in the undergraduate school. However, it can be fairly said that until a few years ago most medical school curriculums did not provide an effective and integrated presentation of this important subject.

On the basis of a study of cancer teaching in medical schools made early in 1946, our National Advisory Cancer Council recommended that the National Cancer Institute undertake a program of financial assistance to medical schools to coordinate and improve the teaching of cancer to undergraduates, thereby increasing

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the students' awareness of cancer. The program, based on these recommendations, has gained universal acceptance during the 7 years of its operation, and today all approved medical schools are participating in the program.

Each of the 4-year medical schools receives a grant up to \$25,000 annually, and each 2-year medical school receives a grant up to \$5,000 a year for the broad purpose of correlating and improving its cancer instruction. Within this general purpose the schools have been permitted maximum latitude to develop the type of program which best meets their particular circumstances. We have always felt that the direction of teaching programs must not come from the outside, but must be intramural and autonomous. Our belief has been justified not only by the widespread acceptance of this program, but by the perceptible improvement in cancer teaching.

A parallel program through which grants up to \$5,000 annually are made to dental schools for instruction of undergraduate students in the recognition of oral cancer has been in existence for approximately the same period of time. This program is based on the fact that a large proportion of oral cancer cases are first seen by dentists, and only a limited percentage of these are recognized as malignant conditions requiring immediate referral to adequate medical attention. This program, too, has enjoyed widespread acceptance, and practically all approved dental schools are participating.

In recent years considerable effort has been devoted to the improvement of cancer instruction in a limited number of schools of nursing in order to determine the most practical methods of providing graduates with a better understanding of cancer and to equip them better for handling cancer nursing activities.

For a number of years similar educational grants have been extended to a small number of schools of public health in order to provide instruction for health department personnel in the public health aspects of the cancer problem.

With the increase in the magnitude of the cancer problem, there has developed a need for physicians with special training in the diagnosis and treatment of cancer. Both voluntary and governmental groups provide support for specialized training of graduate physicians.

The institute's program enables young graduate physicians interested in cancer to undertake clinical training in specialized fields related to its diagnosis and treatment. In recent years there has been a sharp increase in the number of physicians receiving such training in the three major disciplines of surgery, radiology, and pathology. At present, 143 graduate physicians are being supported in such training throughout the country.

For the practicing physicians, a number of attempts have been made to bring recent information about the disease directly to them. One of the most important of these has been the production, jointly by the institute and the American Cancer Society, of a series of films for professional audiences depicting the early diagnosis of cancer. In this series individual films have dealt with the diagnosis of breast, gastrointestinal, uterine, oral cancer, and lung cancer.

These films have been made available to practitioners through medical societies, medical schools, State health departments, and State divisions and county units of the American Cancer Society.

Other attempts at professional education have been handled through support of national cancer conferences, cancer symposiums, professional bulletins, cancer manuals or guidebooks, and refresher courses. These attempts at professional education have met with varying degrees of success; however, it is an essential part of the cancer problem and is considered a field requiring continuous efforts.

### **An Informed Public**

The history of public understanding of the cancer problem in America has been one of gradual gain in the past century, with a marked increase in public interest and awareness of cancer in recent years. It is conceded by most authorities that a large and continuous education program, based on accurate data and using currently available knowledge, will result in considerable control of mortality from many types of cancer. To be successful, a public education program must stimulate the individual's awareness of cancer and motivate him to seek medical attention at the earliest possible moment in the development of cancer.

To develop an informed public, the institute has created educational materials which complement those of voluntary groups. And it has produced, in conjunction with the American Cancer Society, public information materials. Notable among these has been the film entitled "Breast Self-examination" which presents to women basic facts about breast cancer and urges them to seek their physician's advice at an early date. Another recently released film, "The Warning Shadow," was produced under the same sponsorship and is directed toward men over 45 years of age, urging them to seek semi-annual chest X-rays from their physicians.

In addition to assistance in production, the institute has developed arrangements with the American Cancer Society for the use of such information materials in a manner which would stimulate the individual's awareness of cancer and motivate the early seeking of medical care.

In general, the public is better informed about cancer today than at any time in history. However, even with progress in research and therapy, the education problem will continue and, in fact, may increase.

### **Cancer Prevention**

In the field of cancer prevention, knowledge has been meager largely because in the past cancer workers have given little attention to environmental factors which may have a relationship to the causation of human cancer. Much of the knowledge now available has resulted from studies on small groups of people utilizing statistical, genetic, epidemiological, and other techniques to uncover relationships between cancer and environmental factors. For example, the first known etiological agent for scrotal cancer was confined to a small occupational group, the chimney sweeps of London.

Since the inception of the cancer control program, the potentials lying in the field of environmental cancer have been recognized. It was felt that, if relationships could be established between the development of cancer and certain specific materials the individual encounters in his home or industrial environment, it would be possible to eliminate or reduce the exposure to such carcinogenic materials, thereby preventing the development of certain cancers.

Numerous studies and investigations that have an immediate bearing on environmental factors have been undertaken by the National Cancer Institute or have been supported through grants. These studies have shown that most persons, if not all, have some degree of exposure to carcinogenic environmental agents under modern living conditions. They have also shown, however, that there is a latent period before specific cancers appear and that this is related to the degree and duration of exposure to a carcinogenic agent.

While there is much disagreement regarding the exact nature and the role of some of these so-called environmental carcinogenic factors—the current controversy concerning the relationship of cigarette smoking and lung cancer, for one—there has been accumulating in recent years much evidence that cannot be overlooked in respect to cancer control activities.

Among the environmental factors that have been shown to be carcinogenic are (a) certain products and byproducts of the manufacture or processing of aniline dyes, coal tars, and petroleum, (b) arsenicals and some inorganic chemicals, and (c) radioactive substances, X-radiation, and ultraviolet radiation. As more is learned about these and other suspected carcinogenic agents it is feasible to consider the establishment of cancer prevention programs in locations where such hazards exist, incorporating safe production and handling methods for the hazardous materials and instituting periodic examination of the exposed workers.

This is an aspect of the cancer problem which has come under systematic study only recently and in which increased efforts offer unlimited possibilities for making significant contributions to the solution of the cancer problem.

### **Diagnostic Tests and Case Finding**

The key to cancer control today is early diagnosis and treatment, but this statement points up one of our biggest problems—how to find the cancer case early enough. It is recognized that there is no method available today other than general periodic physical examinations which holds promise of discovering early cancer of all types in the population. Periodic examinations do provide the opportunity for discover-

ing a sizable number of early lesions since more than one-half of all cancers occur at sites accessible to direct examination. However, this method is expensive and time consuming; and even if all persons of so-called cancer age could be persuaded to seek periodic examination, there are simply not enough trained hands in the country to do the job. Urgently needed, therefore, is a test which can be applied on a mass basis at reasonable cost and with specificity sufficient enough to identify a high percentage of cancer cases in an early stage.

For a great many years laboratory investigators, as well as practicing physicians, have been looking for differences between persons with early cancer and cancer-free individuals—subtle differences in the blood, sputum, urine, and various body chemicals. The belief that these differences are specific and measurable forms the basis for many reported so-called diagnostic tests. There have been numerous attempts to develop diagnostic and screening tests, and more recently, the entire subject has aroused great public and professional interest. The demand for a diagnostic test has become so great that every new procedure proposed is in danger of premature exploitation before its clinical validity can be determined. Recognizing this situation, the institute, through its Field Investigations and Demonstrations Branch, established a cooperative program with investigators in a number of medical schools. Evaluation of reported cancer tests is carried out under controlled conditions. At the same time, other investigators are encouraged, through grants, to pursue new leads which show promise for the development of a diagnostic or screening test.

Although a general diagnostic test for cancer is not available, some developments in recent years in diagnostic tools may form the basis for a screening test for cancer of specific sites. One of these, the cytological method developed by Papanicolaou and Traut for the discovery of early cervical cancer, has been evaluated and promoted as a diagnostic aid. Its usefulness as a screening procedure for uterine cancer is currently being evaluated by the institute in a study being conducted in Memphis and Shelby County, Tenn., in cooperation with the Univer-

sity of Tennessee Medical School and the county health department. The original cytological technique has been modified for use in the discovery of cancers of other sites, namely, lung, prostate, gastric, and bladder cancer. However, its usefulness and feasibility in these types of cancer have not yet been fully evaluated either as a diagnostic or screening procedure.

A recent promising development in this field is the test for prostatic cancer, developed by Fishman and later modified by Cline. Both of these developments were supported through the institute's control program. Here again further evaluation is necessary and is being carried out by the institute.

Even more recently Penn and Dowdy, with partial support from the control program, have developed a simple blood test which shows some promise of being able to distinguish between people free of cancer and those who may have it. Much more work and evaluation must be carried out on this procedure before it can be declared acceptable.

It might be appropriate at this time to clarify the type of test in which cancer control workers are most interested. Primarily, it is a test which will separate a large group of examinees into two categories—one consisting of those whose reaction to the test is negative, and the other consisting of a relatively smaller number of persons whose reactions are positive and who are, therefore, cancer suspects. It should be a test which would pick up a high percentage of individuals with early localized cancer. It should have a high degree of specificity without a large percentage of either false negative or false positive results. If an acceptable test which meets these general criteria can be developed, it would be a significant forward step in cancer. While such a test would not eliminate the need for further diagnostic procedures to diagnose the case, it would make it possible to concentrate diagnostic efforts on the small group of individuals with positive test results. Despite the many problems associated with the development of an acceptable mass screening test, results to date have been encouraging. It seems entirely possible that a test or battery of tests can be developed which will be effective on a mass screening basis in sorting out cancerous and noncancerous individuals.

In this connection, a small beginning has been made to conduct and support statistical epidemiological studies which might reflect geographic, climatic, racial, socioeconomic, and environmental differences in the occurrence of cancer. Preliminary data from some of these studies suggests that it may be possible to sort out the kinds and types of people who would be most likely to develop cancer. If such determinations could be substantiated, case-finding efforts could be directed more appropriately toward groups with the promise of the greatest cancer yield.

### **Cancer Facilities and Services**

One of the most practical activities which has contributed to the control of cancer to date has been the organization and operation of cancer clinics. These clinics, usually operated in a general hospital, provide an environment in which representatives of the various specialty groups concerned with cancer, such as surgery, pathology, and radiology, can work with the patient's physician in arriving at an accurate diagnosis and effective treatment. The number of cancer clinics in the Nation has increased markedly in recent years. However, there are still not enough to meet the need, and the establishment of additional cancer clinics is being promoted and encouraged. This, along with various other types of services for physicians, has been encouraged through the institute's

program of grants to State health agencies for cancer control activities.

Under this program each State receives an annual allotment based on a formula which takes into account cancer mortality, financial need, extent of the problem, and population density. The grants must be matched on a two-for-one basis. These funds may be used for a variety of purposes which aid physicians as well as the cancer patient. Included among these are support for cancer clinics, cytology services, tissue services, cancer registers, statistical research, professional and lay education, nursing services, limited hospitalization for diagnostic purposes, tumor registers, environmental cancer programs, and tissue slide loan registers. All of the official State agencies now have cancer control programs incorporating a few or several of these features.

### **Conclusion**

An extensive, dynamic cancer control program is under way in this country. It has resulted from the combined efforts of many professional groups, private, voluntary, and governmental, as well as from the efforts of medical specialists, clinicians, private practitioners, public health workers, and scientists. There is a continuing need to improve the nature and effectiveness of the program. The latter will improve as cancer research provides more knowledge about the diagnosis, treatment, and prevention of cancer.



## *X-raying the Heart Cycle*

**BETHESDA, MD.** With the new cardioerentgen actuator, literally a complex trigger for X-ray machines, the taking of X-rays at known times in the heart cycle need no longer be a matter of guesswork.

Superior diagnosis and treatment of heart ailments can often hinge on the cardiologist's sure knowledge that each successive X-ray picture to be compared, sometimes taken years apart, was shot at exactly the same instant in the heart cycle. The ever-changing normal heart volumes and the subtle enlargements of sick hearts are variables that frequently

deserve precise identification and correlation before two X-ray films can be truly compared.

With the new instrument developed by the Public Health Service at the Laboratory of Technical Development, National Heart Institute, the cardiologist can be assured specific mechanical help in this endeavor.

The photograph illustrates the operation of the instrument. The actuator, housed in a special control box (right) operates in conjunction with a conventional electrocardiograph (left) that continuously traces the heart's electrical activity. This activity is correlated with the expansion and contraction of the heart. The electrocardiographic signal triggers the X-ray exposure at any selected time in the heart cycle.

A monitoring photo cell, hanging

below the patient's elbow in the background of the photograph, detects the X-ray exposure and feeds an electrical pulse back into the electrocardiographic curve, marking the exact instant of exposure. A calibrated switch on the actuator permits proper time selection with respect to heart rate so that films can be taken at full expansion, full contraction, or at any intermediate time. In addition, the instrument contains a provision to prevent double exposure.

The actuator is not yet commercially available. A circuit diagram showing the wiring of the instrument and detailed technical information may be obtained from Dr. Bert R. Boone, chief, Laboratory of Technical Development, National Heart Institute, National Institutes of Health, Public Health Service, Bethesda 14, Md.

